THE CHROMOSOMES OF SOME AUSTRALIAN LIVERWORTS.

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(One Text-figure.)

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Synopsis.

The chromosomes of four species of Australian liverworts are described as follows: *Riccardia maxima* Schiffn., n = 8, including a heteromorphic pair at meiosis; *Symphyogyna obovata* Tayl., n = 8, including a heteromorphic pair at meiosis; *Umbraculum flabellatum* Gottsche, n = 9, including a microchromosome; *Metzgeria furcata* (L.) Lindb., n = 9.

Some of the genera and species of Australian liverworts are widely distributed throughout the world, but many are relatively restricted in their distribution. There is only one chromosome record for Australian material, a count of n = 5 (plus a variable number of fragments) for *Phaeoceros laevis* (L.) Prosk. subsp. *carolinianus* Prosk. (Anthocerotales) from New South Wales (Proskauer, 1957).

The chromosome numbers characteristic of most liverwort genera are well known (Berrie, 1960), and since there is little variation within each genus it is generally only necessary to tabulate new records without detailed description. The four species of liverworts belonging to the Jungermaniales anacrogynae which are treated here all show features of special interest which make a slightly more detailed account desirable. The justification in each instance is either that the chromosome number is unusual for the genus (*Riccardia maxima*) or that these are the first full records published for a member of the genus concerned.

There are several points of special significance in the chromosome complement of a liverwort, to which reference will be made. These are: (i) the presence of sex chromosomes in some dioecious species, forming a heteromorphic pair at meiosis; (ii) the presence of a very small chromosome, the microchromosome, in the complement of some species; (iii) the presence of chromosomes which are largely heterochromatic (heteropycnotic), and stain differently from the other chromosomes at certain stages of mitosis and meiosis.

An aceto-orcein squash technique was used for all preparations.

Riccardia maxima Schffn. (Aneuraceae).

Riccardia maxima is dioecious, and is typical of the genus in all morphological features except its very large size. It is recorded from Java, Sumatra and Australia, and is quite common near waterfalls and at similar sites in the neighbourhood of Sydney. The population examined here was collected at Oxford Falls, near Sydney.

The gametic chromosome number is 8. Records for twelve other species of *Riccardia* are for n = 10, or a multiple of 10 (Berrie, 1960). Variation in basic chromosome number within a liverwort genus is unusual. At prophase of meiosis there is a distinct difference in size between the large heterochromatic parts of the constituents of one of the bivalents (Figure 1*a*). This bivalent presumably represents a pair of sex chromosomes. The difference in size is not great, and is difficult to detect at first metaphase and later stages of meiosis. *Riccardia pinguis* (L.) Gray and a number of other species have a similar sex chromosome pair (Berrie, 1960).

Symphyogyna obovata Tayl. (Dilaenaceae).

Symphyogyna obovata is dioecious, and is recorded from New Zealand and Australia. There is a record of the chromosomes for one species of this genus (*S. aspera*, n = 8, MacCormick, 1914; Berrie, 1960), but this early record requires confirmation. Material of *S. obovata* was collected beside a spring near Mount Wilson in the Blue Mountains, New South Wales.

At meiosis there are eight bivalents. The components of one bivalent are strongly heteromorphic, and heterochromatic (Figure 1*b*). The larger component is about twice the size of the smaller. This chromosome complement is very similar to that of species of *Pallavicinia*, a closely related genus.

UMBRACULUM FLABELLATUM Gottsche (Metzgeriaceae).

The distribution of *Umbraculum* (*Hymenophytum*) *flabellatum* is restricted to New Zealand and Australia. No chromosome records exist for *Umbraculum*, or for *Hymenophytum*. The material was collected from beside a spring near Mount Wilson in the Blue Mountains, New South Wales.

Observations were made on the apices of stolons of male plants. There are nine chromosomes, one of them a microchromosome (Figure 1*c*).

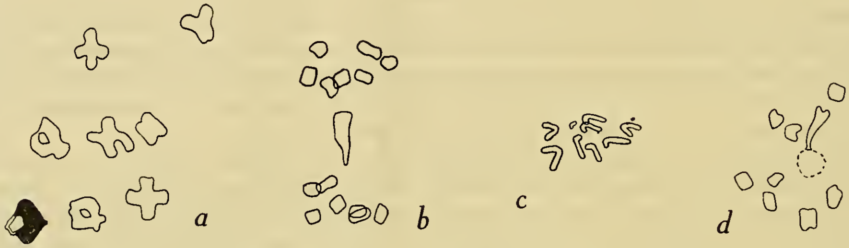

Figure 1.—The chromosomes of some Australian liverworts (× 1,250). (*a*) *Riccardia maxima*, diakinesis (heterochromatin in black). (*b*) *Symphyogyna obovata*, first anaphase of meiosis, the components of the heteromorphic pair not yet separated. (*c*) *Umbraculum flabellatum*, one daughter nucleus at anaphase of mitosis. (*d*) *Metzgeria furcata*, prophase of meiosis.

METZGERIA FURCATA (L.) Dum. (Metzgeriaceae).

Metzgeria furcata is cosmopolitan. There are no well documented records of the chromosomes, and only an approximate chromosome number is available for this species (n = 8–10, Heitz, 1942).

The material came from an unidentified locality in New South Wales. The gametic chromosome number, counted at prophase of meiosis, is 9. There is no microchromosome. In all nuclei in the material examined the components of one large bivalent are in intimate terminal contact with the nucleolus (Figure 1*d*).

References.

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